GRAIL-identified gravity anomalies in Oceanus Procellarum: Impact or magmatic origin?

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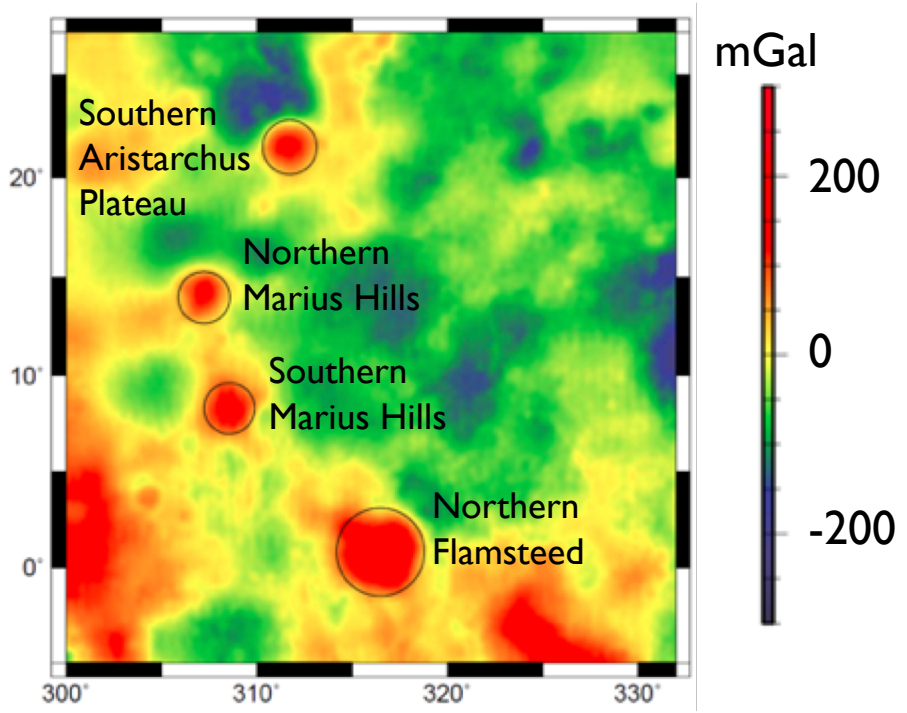
Short Summary

- Constrain the subsurface structures that contribute to four quasi-circular positive gravity anomalies (>150 mGal) similar to basin-scale mascons.
- Previous work has suggested that these four positive gravity anomalies may be due to lava-filled impact craters or subsurface volcanic sills
- Use new GRAIL solutions (6x higher resolution) to test filled-impact or magmatic intrusion hypotheses.
- Determine density structure of upper crust in mare-covered Procellarum KREEP terrane.

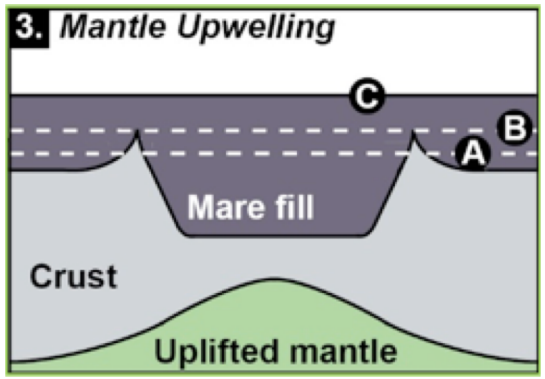
Duration of Award: FY18-19

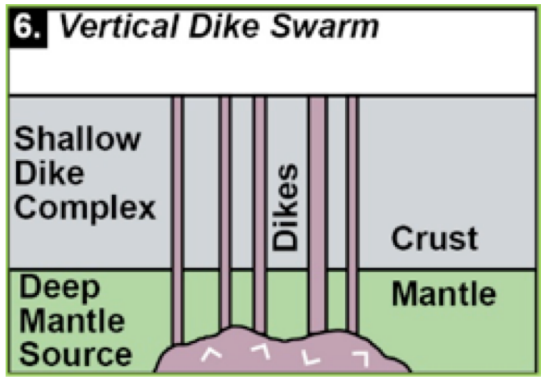


GRAIL Bouguer gravity anomaly over degrees 6 to 660 (~8 km resolution).

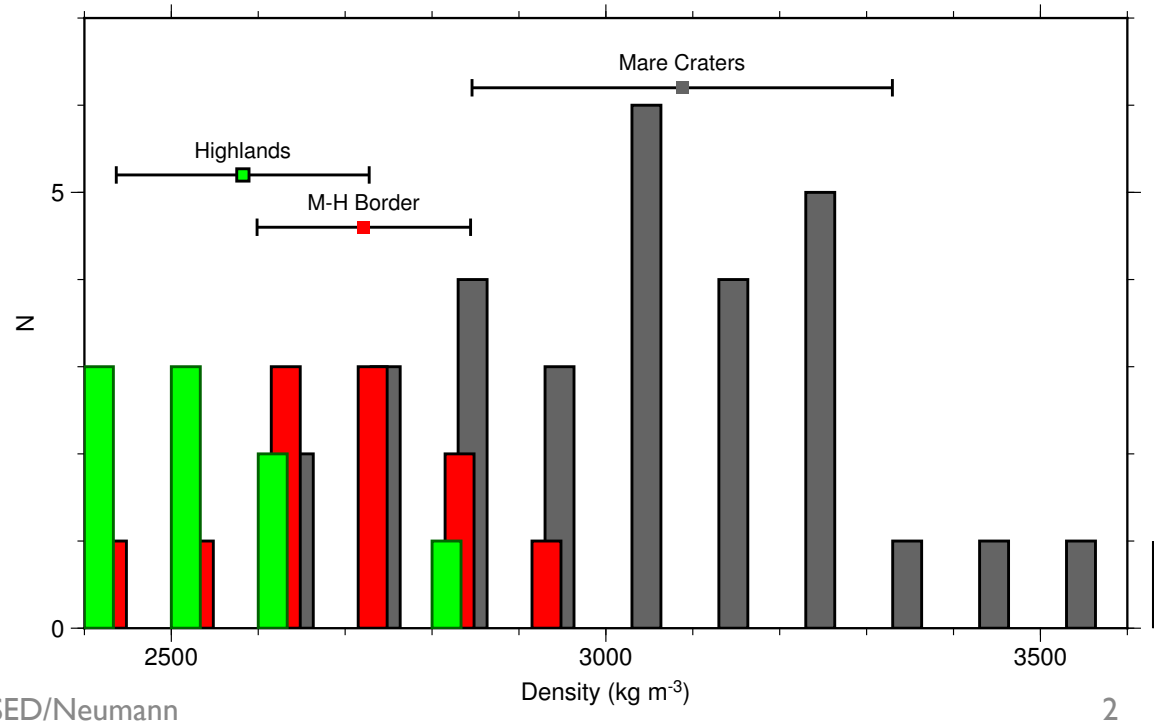
Major Findings or Results

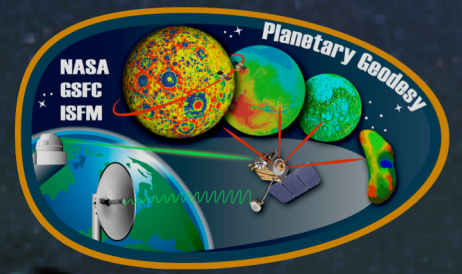
The Procellarum gravity anomalies are consistent with mare-filled craters but also require mantle uplift and/or magmatic intrusion from deeper source.





Denser mafic crust reduces the density contrast with mare fill and requires deeper origin for Oceanus Procellarum mascons.





Metrics Delivered

- Paper on Procellarum nearing submission to Icarus
- Abstracts submitted to Bombardment conference, AGU FM, Presentation to Lunar Polar Volatiles workshop.
- Collaboration (unfunded) with 1 LDAP selected, 3 submitted
- Mentorship of NASA Jenkins graduate Fellow
- Data archived/restored from MGS-MOLA
- Completion of Mercury book chapter on crustal structure
- Future work:
  - Continued investigation of Mercury gravity/topography
  - Continued investigation of basin-scale impact history